

AMENDMENTS TO THE CLAIMS

Kindly amend claims 52-53, 57 and 62-63, and add new claims 103-113, as shown in the following listing of claims. The following listing of claims will replace all prior versions and listing of claims in the application.

Listing of Claims

Claims 1-22 (canceled)

Claim 23 (original): A method of determining the presence of an oil spill, comprising:

remotely monitoring a water surface at a first location for the presence of oil to produce first location monitoring data;

remotely monitoring a water surface at a second location for the presence of oil to produce second location monitoring data;

transmitting the first location monitoring data to a receiver at the second location; and

transmitting information related to the first and second location monitoring data to a control station.

Claim 24 (original): A method as recited in claim 23, wherein remotely monitoring the water surface at the first location comprises monitoring the water surface with a microwave radiometer (MWR) unit and with at least one additional sensor.

Claim 25 (original): A method as recited in claim 24, wherein the at least one additional sensor includes a radar unit.

Claim 26 (original): A method as recited in claim 24, further comprising determining whether oil is present on the water surface at the first location, using data from the MWR unit and the at least one additional sensor.

Claim 27 (original): A method as recited in claim 26, wherein transmitting the first location monitoring data includes transmitting raw detection data from the MWR unit and the at least one additional sensor after determining that oil is present on the water at the first location.

Claim 28 (original): A method as recited in claim 26, wherein transmitting the first location monitoring data includes transmitting sensor calibration data after determining that oil is not present on the water surface at the first location.

Claim 29 (original): A method as recited in claim 24, further comprising fusing detection data from the MWR unit and from the at least one additional sensor and transmitting the fused sensor data from the first location to the second location.

Claim 30 (original): A method as recited in claim 29, wherein fusing the detection data includes fusing the detection data at the pixel level.

Claim 31 (original): A method as recited in claim 29, wherein fusing the detection data includes fusing the detection data at the feature level.

Claim 32 (original): A method as recited in claim 23, wherein the first location is at a marginal oil field.

Claim 33 (original): A method as recited in claim 23, wherein the second location is at a main oil platform.

Claim 34 (original): A method as recited in claim 23, wherein remotely monitoring the water surface at at least one of the first and second locations includes monitoring from a height in the range 10 m - 300 m above the water level.

Claim 35 (original): A method as recited in claim 23, wherein remotely monitoring the water surface at at least one of the first and second locations includes monitoring from a height in the range 10 m - 100 m above the water level.

Claim 36 (original): A method as recited in claim 23, wherein remotely monitoring the water surface at at least one of the first and second locations includes monitoring from a height in the range 30 m - 300 m above the water level.

Claim 37 (original): A method as recited in claim 23, wherein remotely monitoring the water surface at at least one of the first and second locations includes monitoring from a height in the range 30 m - 100 m above the water level.

Claim 38 (original): A method as recited in claim 23, wherein transmitting information related to the first and second location monitoring data to a control station comprises transmitting the information via satellite.

Claim 39 (original): A method as recited in claim 23, further comprising aggregating the transmitted information related to the first and second location monitoring data with additional environmental information and presenting the aggregated information to a user.

Claim 40 (original): A method as recited in claim 39, wherein the additional environmental information includes at least one of a map, weather information and simulation information.

Claim 41 (original): A method as recited in claim 23, further comprising transmitting information derived from the information related to the first and second location monitoring data from the control station to a user.

Claim 42 (original): A method of detecting an oil spill at an offshore location, comprising:

receiving first detection data from a microwave radiometer (MWR) unit mounted on a fixed offshore platform;

receiving second detection data from at least an additional sensor mounted on the fixed offshore platform;

combining the first and second detection data to form fused detection data; and

determining whether oil is present on the water surface at the offshore location based on the fused detection data.

Claim 43 (original): A method as recited in claim 42, wherein the at least one additional sensor is a radar unit.

Claim 44 (original): A method as recited in claim 42, further comprising determining whether oil is present on the water surface at the offshore location based on the fused detection data at the fixed offshore platform.

Claim 45 (original): A method as recited in claim 42, further comprising determining whether oil is present on the water surface at the offshore location based on the fused detection data at a site different from the fixed offshore platform.

Claim 46 (original): A method as recited in claim 42, at least one of the MWR unit and the at least one additional sensor being mounted at a height in the range 10 m to 300 m above the water surface.

Claim 47 (original): A method as recited in claim 42, at least one of the MWR unit and the at least one additional sensor being mounted at a height in the range 30 m to 300 m above the water surface.

Claim 48 (original): A method as recited in claim 42, at least one of the MWR unit and the at least one additional sensor being mounted at a height in the range 10 m to 100 m above the water surface.

Claim 49 (original): A method as recited in claim 42, at least one of the MWR unit and the at least one additional sensor being mounted at a height in the range 30 m to 100 m above the water surface.

Claim 50 (original): A method as recited in claim 42, further comprising rotating at least a first portion of the MWR unit about a vertical axis to sweep out an azimuthal detection area.

Claim 51 (original): A method as recited in claim 50, further comprising moving at least a second portion of the MWR unit in a direction parallel to the vertical axis so as to change a range to a detection area.

Claim 52 (currently amended): A method as recited in claim 51, wherein the second portion of the MWR ~~senser~~ unit is moved through a vertical movement amount for each rotation of the first portion about the vertical axis.

Claim 53 (currently amended): A method as recited in claim 51, wherein the second portion of the MWR ~~senser~~ unit is a dish reflector.

Claim 54 (original): A method as recited in claim 51, wherein the first portion of the MWR unit comprises the second portion of the MWR unit.

Claim 55 (original): A method as recited in claim 50, wherein the at least an additional sensor includes a radar unit having a radar antenna, and further comprising rotating the radar antenna around a radar axis parallel to the vertical axis.

Claim 56 (original): A method as recited in claim 55, wherein the radar axis is coincident with the vertical axis.

Claim 57 (currently amended): A method as recited in claim 42, further comprising moving at least a portion of the MWR ~~sensor~~ unit in a continuous manner during a detection cycle so as to reduce vibrations.

Claim 58 (original): A method as recited in claim 42, wherein the at least an additional sensor includes at least one of an IR/UV sensor and a lidar unit.

Claim 59 (original): A method as recited in claim 42, wherein combining the first and second detection data includes fusing the detection data at the pixel level.

Claim 60 (original): A method as recited in claim 42, wherein combining the first and second detection data includes fusing the detection data at the feature level.

Claim 61 (original): A system for determining the presence of an oil spill, comprising:

a first monitor unit at a first, fixed offshore location for remotely monitoring a water surface at the first location, the first remote monitor unit producing first location monitoring data;

a second monitor unit at a second, fixed offshore location for remotely monitoring a water surface at the second location, the second monitor unit producing second location monitoring data;

a first transmitter at the first location coupled to receive the first location monitoring data and to transmit the first location monitoring data to the second location;

a receiver at the second location to receive the first location monitoring data; and

a second transmitter at the second location coupled to transmit information derived from the first and second location monitoring data to a control station.

Claim 62 (currently amended): A system as recited in claim 61, wherein the first and second ~~monitoring~~ monitor units each include at least a respective microwave radiometer (MWR) unit and an additional respective oil sensor.

Claim 63 (currently amended): A system as recited in claim 62, wherein the at least one additional sensor of at least one of the first and second ~~monitoring~~ monitor units includes a radar unit.

Claim 64 (original): A system as recited in claim 61, further comprising a controller at the second location, coupled to receive at least one of first location monitoring data and second location monitoring data, the controller being adapted to determine the presence of oil on the water surface at at least one of the first and second locations, based on the first and location monitoring data respectively.

Claim 65 (original): A system as recited in claim 61, further comprising a controller at the first location to receive detection data from the first monitor unit.

Claim 66 (original): A system as recited in claim 65, wherein the first transmitter transmits raw detection data from the first monitor unit as the first location monitoring data, after the controller at the first location determines that oil is present on the water at the first location.

Claim 67 (original): A system as recited in claim 65, wherein the first transmitter is transmits sensor calibration data from the first monitor unit as the first location monitoring data after the controller at the first location determines that oil is not present on the water surface at the first location.

Claim 68 (original): A system as recited in claim 65, wherein the controller at the first location fuses detection data from at least two sensors in the first monitor.

Claim 69 (original): A system as recited in claim 68, wherein the controller at the first location fuses the detection data at the pixel level.

Claim 70 (original): A system as recited in claim 68, wherein the controller at the first location fuses the detection data at the feature level.

Claim 71 (original): A system as recited in claim 61, at least one of the first and second monitor units monitors the water surface at the first and second locations respectively from a height in a range from 10 m to 300 m above the water level.

Claim 72 (original): A system as recited in claim 71, wherein the range is from 10 m to 100 m above the water level.

Claim 73 (original): A system as recited in claim 71, wherein the range is from 30 m to 300 m above the water level.

Claim 74 (original): A system as recited in claim 71, wherein the range is from 30 m to 100 m above the water level.

Claim 75 (original): A system as recited in claim 61, wherein the second transmitter is a satellite transmitter.

Claim 76 (original): A system as recited in claim 61, further comprising an on-shore control station having a receiver to receive the information derived from the first and second location monitoring data from the second transmitter.

Claim 77 (original): An oil spill detector for detecting oil spills from a ship-borne platform, comprising:

an oil spill sensor unit mountable to the ship-borne platform, the oil spill sensor unit comprising

a microwave radiometer (MWR) sensor,

at least one additional remote oil sensor; and

a data analyzer coupled to receive input from the MWR sensor and the at least one additional remote oil sensor, the data analyzer being adapted to produce an output signal indicative of an oil spill in response to the input received from the MWR sensor and the at least one additional remote oil sensor;

wherein the oil spill sensor unit compensates for motion of the ship so as to increase accuracy of the output signal.

Claim 78 (original): A detector as recited in claim 77, wherein the at least one additional remote sensor is a radar unit.

Claim 79 (original): A detector as recited in claim 77, wherein at least a first portion of the MWR sensor is rotated about a vertical axis to sweep out an azimuthal detection area.

Claim 80 (original): A detector as recited in claim 79, wherein the data analyzer uses input from the MWR sensor and the at least one additional oil sensor

corresponding to a selected azimuthal range relative to the ship on which the oil spill sensor unit is mounted.

Claim 81 (original): A detector as recited in claim 79, wherein at least a second portion of the MWR sensor is moves in a direction parallel to the vertical axis so as to change a range to a detection area.

Claim 82 (original): A detector as recited in claim 81, wherein the second portion of the MWR sensor is moved through a vertical movement amount for each rotation of the first portion about the vertical axis.

Claim 83 (original): A detector as recited in claim 81, wherein the second portion of the MWR sensor is a dish reflector.

Claim 84 (original): A detector as recited in claim 81, wherein the first portion of the MWR sensor comprises the second portion of the MWR sensor.

Claim 85 (original): A detector as recited in claim 77, wherein at least a portion of the MWR sensor is moved in a continuous manner during a detection cycle so as to reduce vibrations.

Claim 86 (original): A detector as recited in claim 79, wherein the at least one additional remote oil sensor unit includes a radar unit having a radar antenna, the radar antenna being rotated around a radar axis parallel to the vertical axis.

Claim 87 (original): A detector as recited in claim 86, wherein the radar axis is coincident with the vertical axis.

Claim 88 (original): A detector as recited in claim 77, wherein the oil spill sensor unit is mounted so as to maintain a constant angle relative to the horizon, irrespective of the ship's motion.

Claim 89 (original): A detector as recited in claim 77, wherein the data analyzer deconvolves the motion of the ship from the input received from at least the MWR sensor.

Claim 90 (original): A ship-borne method of detecting an oil spill, comprising
monitoring a surface of the water from the ship using a microwave radiometer (MWR) sensor,
monitoring the surface of the water from the ship using at least one additional remote oil sensor;
compensating for motion of the ship in at least one of taking and analyzing data from at least the MWR sensor; and
determining, in response to detection data from at least one of the MWR sensor and the at least one additional remote oil sensor whether oil is present on the water surface.

Claim 91 (original): A method as recited in claim 90, wherein monitoring the surface of the water from the ship using at least one additional remote oil sensor includes monitoring the water using a radar unit.

Claim 92 (original): A method as recited in claim 90, further comprising rotating at least a first portion of the MWR sensor about a vertical axis to sweep out an azimuthal detection area.

Claim 93 (original): A method as recited in claim 92, further comprising moving at least a second portion of the MWR sensor in a direction parallel to the vertical axis so as to change a range to a detection area.

Claim 94 (original): A method as recited in claim 93, further comprising moving the second portion of the MWR sensor through a vertical movement amount for each rotation of the first portion about the vertical axis.

Claim 95 (original): A method as recited in claim 93, wherein the second portion of the MWR sensor is a dish reflector.

Claim 96 (original): A method as recited in claim 93, wherein the first portion of the MWR sensor comprises the second portion of the MWR sensor.

Claim 97 (original): A method as recited in claim 90, wherein at least a portion of the MWR sensor is moved in a continuous manner during a detection cycle so as to reduce vibrations.

Claim 98 (original): A method as recited in claim 92, wherein the at least one additional remote oil sensor includes a radar unit having a radar antenna, and further comprising rotating the radar antenna around a radar axis parallel to the vertical axis.

Claim 99 (original): A method as recited in claim 90, wherein the radar axis is coincident with the vertical axis.

Claim 100 (original): A method as recited in claim 90, wherein compensating for the motion of the ship includes maintaining the oil spill sensor unit at a constant angle relative to the horizon, irrespective of the ship's motion.

Claim 101 (original): A method as recited in claim 90, wherein compensating for the motion of the ship includes deconvolving the effect of the ship's motion from the measured data to produce deconvolved detection data, and determining whether oil is present on the water surface includes analyzing the deconvolved detection data.

Claim 102 (previously presented): A method as recited in claim 42, wherein combining the first and second detection data includes automatically aggregating the detection data at pixel level to enable pattern recognition in an associated decision algorithm.

Claim 103 (new): A system for monitoring for an oil spill over an extensive surface region of a body of water, comprising:

a plurality of monitoring units disposed at respective near-surface locations distributed throughout the region, each of the monitoring units comprising:

a local oil spill detector comprising a respective first sensor for remotely sensing an oil-related parameter;

a control unit coupled to the local oil spill detector for generating respective location data therefrom; and

a short distance wireless transmitter coupled to the control unit for transmitting the respective location data; and

a main unit disposed in the region and comprising:

a wireless receiver for receiving the location data from one or more of the wireless transmitters of the monitoring units;

a control unit coupled to the wireless receiver for generating consolidated data from the received location data; and

a long distance wireless transmitter coupled to the control unit for transmitting the consolidated data to a receiver outside of the region.

Claim 104 (new): The system of claim 103 further comprising a control station for receiving the consolidated data and generating a final product from the consolidated data and from supplemental data.

Claim 105 (new): The system of claim 103 wherein:

the main unit further comprises a local oil spill detector comprising a respective first sensor for remotely sensing an oil-related parameter;

the control unit of the main unit is coupled to the local oil spill detector of the main unit for generating main unit location data therefrom, and for generating the consolidated data from the main unit location data as well as from the received location data.

Claim 106 (new): The system of claim 103 wherein at least one of the monitoring units include a respective receiver for relaying location data from another one of the monitoring units.

Claim 107 (new): The system of claim 103 wherein the location data comprise raw data.

Claim 108 (new): The system of claim 103 wherein:

each of the local oil spill detectors comprises a second sensor; and

each of the control units of the monitoring units is coupled to the first and second sensors of the respective local oil spill detector for:

receiving raw data signals from the first and second sensors of the respective local oil spill detector; and

aggregating the raw data signals at either a pixel level or a feature level to generate fused data.

Claim 109 (new): The system of claim 108 wherein the control unit of the main unit is further coupled to the wireless receiver for aggregating at least the fused data from the monitoring units to form the consolidated data.

Claim 110 (new): The system of claim 109 wherein the consolidated data comprises area specific reports.

Claim 111 (new): The system of claim 105 wherein:

each of the local oil spill detectors of the monitoring units and the main unit comprises a respective second sensor;

each of the control units of the monitoring units and the main unit is coupled to the first and second sensors of the respective local oil spill detector for:

receiving raw data signals from the first and second sensors of the respective local oil spill detector; and

aggregating the raw data signals at either a pixel level or a feature level to generate fused data; and

the control unit of the main unit is further coupled to the wireless receiver for aggregating the fused data from the monitoring units and the main unit to form the consolidated data.

Claim 112 (new): The system of claim 103 wherein each of the first sensors comprises a microwave radiometer.

Claim 113 (new): The system of claim 103 wherein:

each of the local oil spill detectors comprises a second sensor;

each of the first sensors comprises a microwave radiometer; and

each of the second sensors comprises at least one of an X-band low power radar, an infrared/ultraviolet sensor, and a LIDAR unit.